Characteristics and predictors of high-range speeding offenders

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Abstract

This paper examines an aspect of the data taken from a larger study evaluating the effect of speeding penalty changes on speeding recidivism in Queensland. Traffic offence data from May 1996 to August 2007 were provided to the research team for two cohorts of offenders: individuals who committed a speeding offence in May 2001; and individuals who committed a speeding offence in May 2003. Data included details of the offenders' index offence, previous and subsequent traffic offences (speeding and other) and their demographic characteristics. Using this data the aim of this component of the research was to use demographic data and the previous traffic offences of these individuals to explore the characteristics and predictors of high-range speeding offenders. High-range offenders were identified as those individuals who committed two or more speeding offences with a recorded speed of 30 km/hr or more above the speed limit. For the purposes of comparison, low-range offenders (committed one speeding offence in the time-frame and that offence was less than 15 km/hr over the speed limit) and mid-range offenders (all other offenders) were identified. Using Chi-square and logistic regression analyses, characteristics and predictors of high-range speeding offenders were identified. The implications and limitations of this study are also discussed.

Keywords

Speeding, speeding recidivists, profiling offenders, characteristic of speeding offenders

Introduction

Death and injury from speed-related crashes are a significant public health problem worldwide [1]. Research has demonstrated that travelling at speeds in excess of posted speed limits can substantially increase both the risk of being involved in a crash [2, 3] and the severity of crash outcomes [4, 5]. On Queensland roads in 2005, 21% of all fatal crashes were attributed to speeding [6], whilst Australia-wide, speeding has been identified as a contributing factor in up to 24% of all fatalities [7].

Factors associated with speeding behaviour

There are a variety of factors that have been associated with speeding behaviour including personal, social, situational and legal factors. This particular study focuses on the personal factors contributing to speeding behaviour. Previous studies in the area have found that the following personal factors can contribute to higher driving speeds:

- receiving pleasure from fast driving [8];
- a history of crash involvement, speeding violations and other traffic violations (i.e., a greater number of previous crashes and violations have been found to be positively associated with greater intentions to speed in future and with higher actual driving speeds) [9-12];
- a Type-A personality behaviour pattern [13];
- a higher level of social deviance [14];
- a higher level of perceived driving ability [11];
- attitudes favourable to speeding [11, 12];
- a predisposition to sensation seeking [16]; and
- gender and age, where males and younger drivers are consistently identified as driving at higher speeds [12, 17].

Speeding recidivists and high-range offenders

In many countries, including Australia, speeding drivers have traditionally been considered to be an homogeneous group [18, 19]. However, there is a growing body of evidence to suggest that there are sub-groups of speeding drivers. In particular, there has been some research relating to the characteristics and motivations of recidivist and/or high-range speeding offenders, in particular examining the associations between speeding and other behaviours via traffic and criminal convictions data. Manderson et al [24] reported on a pilot project of 200 speeding recidivists in Queensland who were apprehended and fined for speeding on one day in 1999 (termed the index offence). Prior and subsequent traffic histories was analysed for a five year period either side of the index offence. The presence of speed convictions in the 12 months prior to the index offence was predictive of the severity of the index offence. Those with one or more prior convictions were 2.6 times more likely to be exceeding the speed limit by more than 20 km/hour (termed a high-speed offence) at index offence.

A similar study, though not specific to speeding behaviour, was conducted in Britain to map associations between traffic offending behaviours with other criminal activity [25]. Drivers were classified into three groups of serious traffic offenders: drink drivers, disqualified drivers, and dangerous drivers. The latter group included those who had been convicted of speeding by excessive amounts. Comparisons with criminal history data revealed that a significant proportion of offenders from each of the three driver groups had criminal convictions. Disqualified drivers showed the most involvement with other forms of crime, followed by dangerous drivers, and then drink drivers. The report's summary highlights that serious traffic offenders should not be thought of in isolation from other criminals.

Despite these studies, there are still no clear answers about the factors that motivate speeding offenders or, more particularly, recidivist or high-range offenders. In order to determine the best method of intervention for this group, the limited knowledge we have about speeding drivers generally, and recidivists in particular, needs to be extended.

This paper examines an aspect of the data taken from a larger study evaluating the effect of speeding penalty changes on speeding recidivism in Queensland. The main aim of the larger study is to examine the effects of penalty changes (introduced in April 2003) on driver behaviour by comparing data collected two years prior and subsequent to the penalty changes. Additionally, the project aims to investigate the profile of speeding offenders in terms of their personal characteristics and offending histories. This paper reports on preliminary results relating to this profiling aspect of the project. Specifically, this study aimed to use demographic data and the previous traffic offences of the two cohorts to explore the characteristics and predictors of high-range speeding offenders.

Method

Traffic offence data from May 1996 to August 2007 were provided to the research team by Queensland Transport from the Transport, Registration and Integrated Licensing System (TRAILS). These data were provided for two cohorts of offenders: individuals who committed a speeding offence in May 2001; and individuals who committed a speeding offence in May 2003. The first such offence in the month was taken to be the index offence. Data obtained included details of this offence, previous and subsequent traffic offences (including speeding, alcohol, dangerous driving, unlicensed driving, seatbelt and other offences) and the offenders' demographic characteristics (gender, age), licence level, and licence class. Offenders who did not hold a Queensland driver's licence were excluded from analysis as their demographic, licensing and offences histories were unknown. There were also a number of individuals with missing licence information (3.7%) which were excluded from analyses. There were no significant differences between the two year cohorts on any key variables so all analyses were performed with the combined sample.

High-range offenders were identified as those offenders who committed two or more speeding offences in the study period, with both featuring a recorded speed of 30 km/hr or greater over the speed limit. For the

purposes of comparison, low-range offenders (committed one speeding offence in the time-frame and that offence was less than 15 km/hr in 2001 or 13 km/hr in 2003 over the speed limit[1]) and mid-range offenders (all other offenders) were identified. The coding of the personal characteristic and offence history variables are outlined in Table 1.

Table 1: Variable details and coding

Variable name	Levels	Details
Gender	Male; Female; Unknown	As coded in the original data file
Age	17-24; 25-29; 30-39; 40-49; 50-59; 60-69; 70+	As coded in the original data file
Licence level	Learner; Provisional; Open	As some offenders hold more than one licence, the highest level of licence that they hold was chosen for this variable.
Licence class	Car only; Motorcycle (with or without another class of licence); Heavy vehicle only; Car and Heavy vehicle	As some offenders hold more than one licence, this variable needed to be coded to reflect the various combinations.
Alcohol related offences	No; Yes	All alcohol related traffic offences occurring before the index offence date were identified. If at least one offence occurred then coded 'Yes'.
Dangerous driving offences	No; Yes	All dangerous driving offences occurring before the index offence date were identified. If at least one offence occurred then coded 'Yes'.
Unlicensed driving offences	No; Yes	All unlicensed driving offences occurring before the index offence date were identified. If at least one offence occurred then coded 'Yes'.
Seatbelt offences	No; Yes	All seatbelt offences occurring before the index offence date were identified. If at least one offence occurred then coded 'Yes'.
Other offences	No; Yes	All other traffic offences occurring before the index offence date were identified. If at least one offence occurred then coded 'Yes'.

High-range speed offenders were compared with low and mid-range speed offenders on their personal characteristics and offence histories using chi-square tests for independence. The sample size is quite large so a more stringent alpha rate of 0.001 was used as the basis for determining statistical significance. Also, Cramer's V ($ø_c$) was calculated in order to provide an estimate of effect size to give a clearer idea of the meaningfulness of any statistical significance found. As suggested by Aaron and Aaron [26], a Cramer's V of around 0.10 was considered to be a small effect size, around 0.30 moderate, and around 0.50 or more a large effect size. Post-hoc analyses were also undertaken using an adjusted standardised residual statistic. This

[1] The lowest level of offence category changed from 'Less than 15 km/hour' to 'Less than 13 km/hour' when the penalty change occurred in 2003.

statistic can be used to identify those cells with observed frequencies significantly higher or lower than expected. With an alpha level set at 0.001, any adjusted standard residuals outside -3.29 and +3.29 were considered significant.

In order to address the multivariate relationship between the variables, two logistic regressions were also performed. The first logistic regression was performed with offender type (mid vs. high-range) as the outcome, and the personal characteristic and offence history variables as predictors. The second logistic regression was performed with offender type (low vs. high-range) as the outcome, and the personal characteristic variables and previous alcohol offences as predictors. It was not possible to include the dangerous, unlicensed, seatbelt, or 'other' offence history variables in the second model as the low-range offenders had no variance in their offence histories with all of them having no offence history for these offence types within the time-frame.

Results

Overall, there were 84,468 offenders in the sample, consisting of 4893 (5.8%) low-range, 76465 (90.5%) mid-range, and 3110 (3.7%) high-range offenders.

The results of the Chi-square tests for independence revealed that the low and high-range offenders statistically significantly differed on all personal characteristics. Cramer's V calculations ($ø_c$) indicated a small effect size for licence class, moderate effect sizes for gender and licence level, with a large effect size for age. Specifically, the adjusted standardised residuals indicate that high-range offenders were more likely to be male, be younger, and hold a provisional licence when compared to low-range offenders. It was also the case, that while the majority of low and high-range offenders held a car licence, high-range offender were more likely than low-range offenders to hold a motorcycle licence (with or without another class of licence). High-range offenders were less likely than low-range offenders to hold a heavy vehicle licence (Table 2).

As with the low vs. high-range comparison, the personal characteristics of mid-range offenders statistically significantly differed from those of high-range offenders; however the effect size of these relationships as measured by Cramer's V, were only small. The analyses did indicate, however, that as with the comparison with low-range offenders, high-range offenders were more likely to be male, be younger, and hold a provisional licence when compared to mid-range offenders. Similar again to the comparison with low-range offenders, high-range offenders were more likely to hold a motorcycle licence than mid-range offenders and less likely to hold a heavy vehicle licence (Table 2).

Table 2: Personal characteristics of each speeding offender group

Variable	Level	Low-range n	Low-range %	Mid-range n	Mid-range %	High-range n	High-range %
Gender	Male	2473	50.5*	49796	65.1*	2806	90.2
	Female	2420	49.5*	26669	34.9*	304	9.8
		χ^2 (1) = 1333.7, p<0.001		χ^2 (1) = 840.4, p<0.001			
		$ø_c$ = 0.41		$ø_c$ = 0.10		Referent	
Age	17-24	460	9.4*	13123	17.2*	1258	40.5
	25-29	404	8.3*	10155	13.3*	699	22.5
	30-39	1054	21.5	19288	25.2	695	22.3
	40-49	1111	22.7*	17356	22.7*	315	10.1
	50-59	989	20.2*	11478	15.0*	119	3.8
	60-69	541	11.1*	3758	4.9*	19	0.6
	70+	334	6.8*	1307	1.7	5	0.2
		χ^2 (6) = 2166.9, p<0.001		χ^2 (6) = 1721.1, p<0.001			
		$ø_c$ = 0.52		$ø_c$ = 0.15		Referent	
Licence level	Learner	165	3.4*	3150	4.1	190	6.1
	Provisional	239	4.9*	7170	9.4*	904	29.1
	Open	4489	91.7*	66145	86.5*	2016	64.8
		χ^2 (2) = 980.2, p<0.001		χ^2 (2) = 1334.2, p<0.001			
		$ø_c$ = 0.35		$ø_c$ = 0.13		Referent	
Licence class	Car only	3445	70.4*	49580	64.8*	1698	54.6
	Motorcycle	906	18.5*	18461	24.1*	1197	38.5
	Heavy vehicle only	496	10.1*	7363	9.6*	160	5.1
	Car and heavy vehicle	46	0.9*	1063	1.4	55	1.8
		χ^2 (3) = 430.7, p<0.001		χ^2 (3) = 364.2, p<0.001			
		$ø_c$ = 0.23		$ø_c$ = 0.07		Referent	

*standardised residuals outside -3.29 to +3.29
Cramer's V = $ø_c$

Chi-square analyses comparing the offence histories of low and high-range offenders revealed statistically significant differences on all offence types, with low-range offenders having fewer previous offences than high-range offenders (see Table 3). Cramer's V statistics showed a small effect size for alcohol, dangerous, unlicensed and seatbelt offences and a large effect size for other offences. It should be noted that in all but one case (alcohol related offences) low-range offenders had no previous offences in the time-frame.

As with the low vs. high-range offenders, the mid-range offenders statistically significantly differed from high-range offenders on all offence types, with mid-range offenders having relatively fewer previous offences than high-range offenders (see Table 3). However, the Cramer's V statistics showed very small effect sizes for these differences.

Table 3: Traffic offence history for each speeding offender group

Variable	Level	Low-range n	Low-range %	Mid-range n	Mid-range %	High-range n	High-range %
Alcohol related	Yes	70	1.4*	3288	4.3	355	11.4
	No	4823	98.6*	73177	95.7*	2755	88.6
		χ^2 (1) = 376.9, p<0.001		χ^2 (1) = 346.3, p<0.001			
		ϕ_c = 0.22		ϕ_c = 0.07		Referent	
Dangerous driving	Yes	0	0.0*	640	0.8	107	3.4
	No	4893	100.0*	75825	99.2*	3003	96.6
		χ^2 (1) = 170.6, p<0.001		χ^2 (1) = 217.8, p<0.001			
		ϕ_c = 0.15		ϕ_c = 0.05		Referent	
Unlicensed driving	Yes	0	0.0*	1052	1.4*	257	8.3
	No	4893	100.0*	75413	98.6*	2853	91.7
		χ^2 (1) = 417.8, p<0.001		χ^2 (1) = 876.3, p<0.001			
		ϕ_c = 0.23		ϕ_c = 0.11		Referent	
Seatbelt	Yes	0	0.0*	2573	3.4*	279	9.0
	No	4893	100.0*	73892	96.6*	2831	91.0
		χ^2 (1) = 454.8, p<0.001		χ^2 (1) = 271.8, p<0.001			
		ϕ_c = 0.24		ϕ_c = 0.06		Referent	
Other	Yes	0	0.0*	10406	13.6*	1136	36.5
	No	4893	100.0*	66059	86.4*	1974	63.5
		χ^2 (1) = 2082.9, p<0.001		χ^2 (1) = 1265.8, p<0.001			
		ϕ_c = 0.51		ϕ_c = 0.13		Referent	

*standardised residuals > 3.29
Cramer's V = ϕ_c

The logistic regression model for the low-range vs. high-range offenders was significant [χ^2 (2) = 3967.1, p<0.001], with approximately half of the variance explained with all variables in the equation [Nagelkerke R^2 = 0.53]. Specifically, there were significant differences for gender, age, licence level, licence class and previous alcohol offences (Table 4).

- Females were 10 times less likely to be high-range offenders than males.
- Offenders aged 30 or older were less likely to be high-range offenders than offenders younger than 30 (from 3.1 to 100 times less likely).
- Offenders with a provisional licence were 1.8 times more likely to be high-range offenders than open licence holders.
- Offenders who held a motorcycle licence were 1.7 times more likely to be high-range offenders than those offenders with just a car licence.
- Offenders with a previous alcohol related traffic offence were 3.7 times more likely to be a high-range speeding offender than those with no previous alcohol related offence.

The logistic regression model for the mid-range vs. high-range offenders was significant [χ^2 (2) = 3633.7, p<0.001], with approximately 16% of variance explained with all variables in the equation [Nagelkerke R^2 = 0.16]. There were a number of significant differences on the personal characteristics (Table 4).

- Females were 3.8 times less likely to be high-range offenders than males.

- Offenders aged 30 years or older were less likely to be high-range offenders than offenders younger than 30 (from 1.8 to 14.3 times).
- Offenders with provisional licences were 1.6 times more likely to be high-range offenders than those with an open licence.
- Offenders with a motorcycle and a car licence were 1.4 times more likely to be high-range offenders than those offenders with just a car licence.

In terms of offending history, speeding offenders with at least one previous dangerous driving offence were 1.5 times more likely to be a high-range offender than those who had no previous dangerous driving offences. Those with at least one previous unlicensed driving offence were 2.3 times more likely to be a high-range offender than those with no previous unlicensed driving offences. Speeding offenders with at least one seatbelt offence were 1.6 times more likely and those with at least one 'other' offence were 2.1 times more likely to be high-range offenders than those with no previous seatbelt or 'other' offence (Table 4).

Table 4: Adjusted ORs and 95% CIs for low vs. high-range and mid vs. high-range on personal characteristics and offence history

		Low vs. High-range			Mid vs. High-range		
		OR[1]	95% CI	p	OR[1]	95% CI	p
Gender	Male	1.00	Referent		1.00	Referent	
	Female	**0.10**	(0.09-0.12)	<0.001	**0.27**	(0.23-0.30)	<0.001
Age	17-24	1.00	Referent		1.00	Referent	
	25-29	0.85	(0.69-1.05)	0.41	0.88	(0.76-0.99)	0.04
	30-39	**0.32**	(0.27-0.39)	<0.001	**0.55**	(0.49-0.61)	<0.001
	40-49	**0.14**	(0.11-0.17)	<0.001	**0.30**	(0.26-0.35)	<0.001
	50-59	**0.06**	(0.04-0.07)	<0.001	**0.17**	(0.14-0.21)	<0.001
	60-69	**0.01**	(0.01-0.02)	<0.001	**0.08**	(0.05-0.13)	<0.001
	70+	**0.01**	(0.003-0.02)	<0.001	**0.07**	(0.03-0.16)	<0.001
Licence level	Open	1.00	Referent		1.00	Referent	
	Provisional	**1.78**	(1.31-2.41)	<0.001	**1.60**	(1.35-1.89)	<0.001
	Learner	0.84	(0.64-1.11)	0.06	0.93	(0.79-1.10)	0.20
Licence class	Car only	1.00	Referent		1.00	Referent	
	Motorcycle	**1.68**	(1.71-2.39)	<0.001	**1.35**	(1.25-1.47)	<0.001
	Heavy vehicle only	0.87	(0.69-1.09)	0.13	0.81	(0.68-0.96)	0.02
	Car and heavy vehicle	1.12	(0.69-1.79)	0.50	1.01	(0.76-1.35)	0.92
Alcohol related	No	1.00			1.00	Referent	
	Yes	**3.68**	(2.69-5.04)	<0.001	1.19	(1.05-1.35)	0.01
Dangerous driving	No	-			1.00	Referent	
	Yes	-			**1.54**	(1.23-1.93)	<0.001
Unlicensed driving	No	-			1.00	Referent	
	Yes	-			**2.26**	(1.93-2.64)	<0.001
Seatbelt	No	-			1.00	Referent	
	Yes	-			**1.60**	(1.39-1.84)	<0.001
Other	No	-			1.00	Referent	
	Yes	-			**2.09**	(1.93-2.28)	<0.001

1 Adjusted OR with all variables in the equation

Discussion

There were a number of significant and meaningful differences between low and high-range offenders on personal characteristics and offence histories. Specifically, high-range offenders were more likely to be male, be young, and hold a provisional licence. They were also more likely to hold a motorcycle licence than low-range offenders. In terms of offending histories, high-range offenders were more likely to have committed alcohol, unlicensed driving, dangerous driving, seatbelt and 'other' previous offences than low-range offenders. In fact, low-range offenders had no previous unlicensed driving, dangerous driving, seatbelt, and 'other' offences and very few previous alcohol related offences.

While there were statistically significant differences between mid and high-range offenders on personal characteristics and offence histories, the differences were not as meaningful as those found for the low vs. high-range offenders. The statistical significance found for the comparison between mid and high-range offenders may simply be due to the large sample size (although a very stringent alpha rate was applied).

The significant predictors of being a high-range speeding offender included gender, age, licence level, and licence class, in comparison to both low and mid-range offenders. Offending history variables (with the exception of alcohol related offences) were also significant predictors of being a high-range speeding offender in comparison to mid-range offenders. In summary, the key findings indicate that when compared to low and mid-range offenders:

- females were less likely to be high-range speeding offenders than males;
- offenders aged 30 or older were less likely to be high-range speeding offenders than those younger than 30;
- offenders with provisional licences were more likely to be high-range speeding offenders than open licence holders;
- offenders who held a motorcycle licence (often in conjunction with another licence) were more likely to be high-range speeding offenders than those with only a car licence; and
- offenders with previous unlicensed driving, dangerous driving, seatbelt, and 'other' offences were more likely to be high-range offenders than those with no previous offences.

Not surprisingly, the personal factors predicting high-range offending in comparison to low-range offending were much stronger than when high-range offending was compared to mid-range offending. It seems that while there were differences in the characteristics and predictors of high-range speeding offenders when compared to mid-range offenders, the differences between high and low-range offenders were more significant and meaningful.

The results of this study indicate that there is an association between speeding and other offences committed on the road. In particular, the results of the study indicate that high-range speeding offenders are a problematic group of drivers, who are more likely to commit other driving offences. Authorities face many challenges in attempting to influence the behaviour of such groups of drivers, as there are, it seems, multiple offending behaviours to contend with. There is still much to learn regarding the deterrent effect of a range of sanctions, and the effects of penalty changes on road user behaviours.

The limitations of this study should be borne in mind when interpreting the findings. There are a number of issues with routinely collected data that need to be considered. Data of this kind is recorded and kept for administrative rather than research purposes and is therefore limited in what information it can provide. Also, there can be errors in recording and coding that lead to inaccurate or incomplete data. As mentioned previously, there were a number of cases that did appear in the dataset as having committed a speeding offence in May 2001 or May 2003, however data relating to their licence level and class were missing.

Further research

The findings of this study highlight a number of directions for further research. In particular, there is a need to find out more about the characteristics of high-range speeding offenders. To this end, the researchers have received and are in the process of analysing data relating to crash histories of all offenders, and criminal histories of a random sub-sample of offenders, in order to inform a more comprehensive profile of low, mid and high-range offenders. There is also an ongoing need to better understand the psychological and social factors contributing to speeding recidivism in general, and more specifically among younger age groups and motorcycle riders.

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